

Message Text

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ORIGIN DOE-15

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,O/SCT: J TREVITHICK
;CDA: R WILLIAMSON (INFO)
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FM SECSTATE WASHDC
TO AMEMBASSY VIENNA PRIORITY

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USIAEA

E.O. 11652: N/A

TAGS: TECH, IAEA, ENRG

SUBJECT: CONTROLLED THERMONUCLEAR FUSION RESEARCH

REF: VIENNA A-023

1. MISSION IS REQUESTED TO RESPOND BY LETTER AS
FOLLOWS (AND AS DRAFTED BY DOE) TO DIRECTOR GENERAL
EKLUND'S JANUARY 17, 1978, LETTER TO THE MISSION
REGARDING THE GOALS AND PACE OF THE U.S. FUSION PROGRAM
(UNNECESSARY WORDS OMITTED):

QUOTE GOAL OF U.S. FUSION ENERGY EFFORT IS TO DEVELOP
USE OF FUSION ENERGY AS A VIRTUALLY INEXHAUSTIBLE
ENERGY RESOURCE FOR A VARIETY OF APPLICATIONS. PRIMARY
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OBJECTIVE OF PROGRAM TOWARDS THIS GOAL IS TO DEVELOP
SYSTEMS FOR COMMERCIAL PRODUCTION OF CENTRAL STATION
ELECTRIC POWER. SECONDARY OBJECTIVE IS TO EVALUATE
AND DEVELOP OTHER APPLICATIONS OF FUSION SYSTEMS.
POTENTIAL APPLICATIONS INCLUDE (A) PRODUCTION OF
FISSILE MATERIAL, TO EXTEND URANIUM AND THORIUM
RESOURCES AND THUS TO ASSURE FUEL SUPPLIES FOR FISSION

REACTORS, (B) PRODUCTION OF SYNTHETIC FUELS, SUCH AS HYDROGEN GAS TO BE USED DIRECTLY OR CONVERSION OF COAL INTO LIQUID OR GASEOUS FUELS, AND (C) PRODUCTION OF INDUSTRIAL PROCESS HEAT AND HEAT FOR OTHER END-USE CATEGORIES, SUCH AS RESIDENTIAL/COMMERCIAL SPACE HEATING.

TO ACHIEVE ABOVE STATED GOALS, PROGRAM HAS ESTABLISHED SEVERAL OBJECTIVES. FIRST OF THESE IS TO DEVELOP A STRONG SCIENTIFIC AND TECHNICAL BASE SO THAT USEFULNESS OF VARIOUS APPLICATIONS CAN BE CONFIDENTLY ASSESSED. A SECOND OBJECTIVE IS TO CONSTRUCT AND OPERATE, WHEN JUSTIFIED, MAJOR PHYSICS/ENGINEERING SCALING EXPERIMENTS WHICH WILL PROVIDE DATA REQUIRED FOR DESIGN OF ENERGY-PRODUCING PROTOTYPE REACTORS. A THIRD OBJECTIVE IS TO PERFORM SYSTEMS AND CONCEPTUAL DESIGN STUDIES OF ENERGY PRODUCING SYSTEMS. A FOURTH OBJECTIVE IS TO PERFORM SYSTEMS STUDIES TO HELP GUIDE R&D PROGRAM TOWARDS A FINAL PRODUCT THAT WILL POSSESS CHARACTERISTICS THAT MAXIMIZE ITS BENEFICIAL IMPACT ON SOCIETY. A FIFTH OBJECTIVE IS TO CONSTRUCT AND OPERATE, WHEN JUSTIFIED, ENERGY-PRODUCING EXPERIMENTAL FUSION REACTORS, WHICH WILL PROVIDE THE BASIS FOR COMMERCIALIZATION.

THE PROGRAM STRATEGY IS TO PROCEED SYSTEMATICALLY
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THROUGH FOUR STAGES OF DEVELOPMENT: (1) PROOF-OF-PRINCIPLES PROGRAMS, (2) MAJOR SCALING EXPERIMENTS, (3) ENERGY-PRODUCING EXPERIMENTAL REACTORS, AND (4) COMMERCIALIZATION. PRIMARY EMPHASIS AT THIS TIME IS ON STAGES (1) AND (2) IN WHICH A BROAD SCIENTIFIC AND TECHNOLOGICAL BASE WILL BE DEVELOPED SO THAT USEFULNESS OF VARIOUS APPLICATIONS CAN BE CONFIDENTLY ASSESSED. THE STAGE OF DEVELOPMENT ENTITLED QUOTE ENERGY PRODUCING EXPERIMENTAL REACTORS UNQUOTE PROVIDES BRIDGE BETWEEN FUSION ENERGY EXPERIMENTS AND COMMERCIALIZATION. THE FINAL STAGE, QUOTE COMMERCIALIZATION, UNQUOTE INVOLVES DESIGN, CONSTRUCTION AND OPERATION OF THOSE DEMONSTRATION FACILITIES NECESSARY TO PROVE TECHNICAL AND ECONOMIC FEASIBILITY OF COMMERCIAL FUSION ENERGY SYSTEMS.

DURING NEXT FIVE YEAR PERIOD THE PRIMARY EMPHASIS WILL BE PLACED ON PERFORMING PHYSICS PROOF-OF-PRINCIPLE EXPERIMENTS. IN ADDITION, MAJOR PHYSICS/ENGINEERING SCALING EXPERIMENTS ARE BEING CONSTRUCTED AND

OPERATION WILL BE INITIATED DURING THIS PERIOD. ALSO,

DESIGN STUDIES AND LONG-LEAD TIME ENGINEERING ACTIVITIES
RELATED TO ENERGY-PRODUCING EXPERIMENTAL FUSION REACTORS
AND TO COMMERCIALIZATION WILL BE CONTINUED AT AN
APPROPRIATE LEVEL.

BY EARLY 1980'S LARGE SCALING EXPERIMENTS NOW NEARING
COMPLETION SHOULD HAVE PROVIDED SIGNIFICANT DATA ON
BASIC PHYSICS AND SCALING CHARACTERISTICS, THIS WILL BE
FOLLOWED BY QUOTE BREAKEVEN UNQUOTE EXPERIMENTS IN
1983-85 TIME FRAME. WE BELIEVE SUCH EXPERIMENTS,
ACCOMPANIED BY STRONG THEORY AND TECHNOLOGY SUPPORT
PROGRAMS, WILL CONFIRM SCIENTIFIC FEASIBILITY OF
CONTROLLED FUSION ENERGY.

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BASED ON DEVELOPMENTS DESCRIBED ABOVE, SUFFICIENT DATA
SHOULD BE AVAILABLE BY 1980-82 TO START CONCEPTUAL
DESIGNS OF THE NEXT GENERATION OF FACILITY WHICH COULD
GENERATE A SIGNIFICANT AMOUNT OF ELECTRICAL ENERGY
AND PROVIDE FOCUS AND RELEVANCE FOR PHYSICS AND
TECHNOLOGY PROGRAMS. IF THE DESIGN DATA IS CONFIRMED
BY QUOTE BREAKEVEN UNQUOTE EXPERIMENTS, IT WOULD BE
POSSIBLE TO PROCEED WITH CONSTRUCTION AND OPERATION OF
A PRIMITIVE POWER PRODUCING SYSTEM IN THE LATE 1980'S
OR EARLY 1990'S. A FULL SCALE COMMERCIAL DEMONSTRATION
COULD THEN BE CARRIED OUT BY ABOUT TURN OF CENTURY.
THESE LATTER MILESTONES WILL, OF COURSE, DEPEND UPON
FAVORABLE SCIENTIFIC RESULTS AND THE OVERALL RESEARCH
POLICY AND APPROVED FUNDING LEVELS. DEGREE OF
COOPERATION AND COLLABORATION AMONG VARIOUS NATIONS
MIGHT ALSO HAVE AN INFLUENCE ON SOME OF TIME SCHEDULES.

THE UNITED STATES BELIEVES CONTINUED AND INCREASED
INTERNATIONAL COOPERATION IN AREAS OF FUSION ENERGY
RESEARCH IS VITAL TO SUCCESS IN FUSION DEVELOPMENT.
THERE ARE MANY ADVANTAGES TO BE OBTAINED FROM SUCH AN
INTERNATIONALIZATION OF A MAJOR RESEARCH AND DEVELOPMENT
PROGRAM. ONE OF THESE IS CLEARLY THAT OF COST
EFFECTIVENESS. NO SINGLE NATION NOW HAS OR NEEDS TO
HAVE A COMPLETELY SELF-SUFFICIENT PROGRAM COVERING
EVERY POSSIBLE APPROACH. INSTEAD, RESEARCH IS AND CAN,
IN FUTURE, BE DISTRIBUTED AMONG COOPERATING NATIONS WITH
RESULTS SHARED BY ALL. IN THIS WAY THE BEST USE OF
NATIONAL SKILLS AND RESOURCES CAN BE ASSURED AND
UNNECESSARY DUPLICATION OF FACILITIES AND PROGRAMS

CAN BE AVOIDED. FURTHERMORE, IT IS CLEAR THAT
DEVELOPMENT OF INEXHAUSTIBLE ENERGY SOURCES FOR THE
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FUTURE IS A WORLD PROBLEM. INTERNATIONAL COOPERATION
IN FUSION RESEARCH WILL DISTRIBUTE THE BENEFITS OF
THIS NEW ENERGY SOURCE TO ALL POTENTIAL USERS.

THE UNITED STATES FULLY SUPPORTS THE CONCEPT, SUGGESTED
IN YOUR LETTER, OF IAEA TECHNICAL COMMITTEES TO REVIEW
PROGRAM STATUS, ASSESS NEEDS AND RECOMMEND FUTURE
COORDINATED DEVELOPMENT EFFORTS. IN THE FIELD OF
MAGNETIC FUSION IT MAY BE POSSIBLE TO DELEGATE
SPECIFIC AREAS OF DEVELOPMENT TO DIFFERENT NATIONAL
ENTITIES AND THEREBY ACHIEVE MEANINGFUL INTEGRATION
OF FUSION ENERGY RESEARCH. THERE PRESENTLY ARE MAJOR
INSTITUTIONAL CONSTRAINTS LIMITING SUCH INTERLOCKING
PROGRAMS, AND IAEA COULD PROVIDE A STRONG LEADERSHIP
ROLE IN SEEKING TO LESSEN SUCH IMPEDIMENTS.

SIMILARLY, WE SUPPORT THE IDEA OF AN INTERNATIONAL
GROUP TO LAY THE GROUNDWORK FOR THE NEXT MAJOR MAGNETIC
CONFINEMENT DEVICES AFTER THE TFTR, JET, JT-60 AND
T-10M. WE BELIEVE SUCH INTERNATIONAL TEAMS COULD PLAY
A SIGNIFICANT ROLE IN SPEEDING THE DEVELOPMENT OF
FUSION ENERGY IN THE MOST EFFICIENT WAY. WE LOOK
FORWARD TO IMPROVED INTERNATIONAL COOPERATION IN
MAGNETIC FUSION RESEARCH UNDER IAEA SPONSORSHIP. END
QUOTE.

2. MISSION REQUESTED PROVIDE DOE COPY OF LETTER
TRANSMITTED TO IAEA. VANCE

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